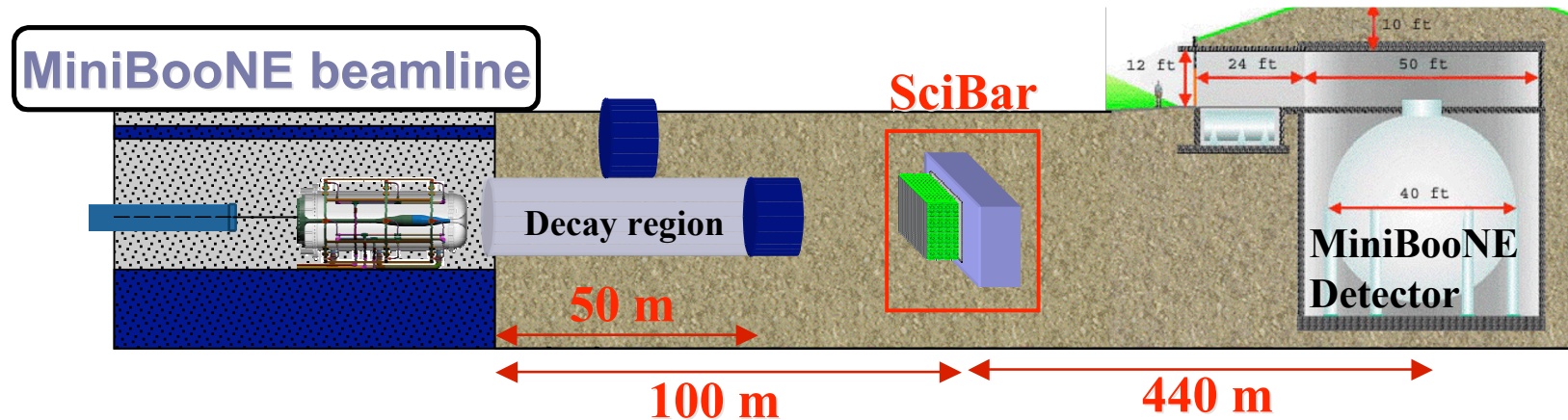


SciBooNE Divisional Review

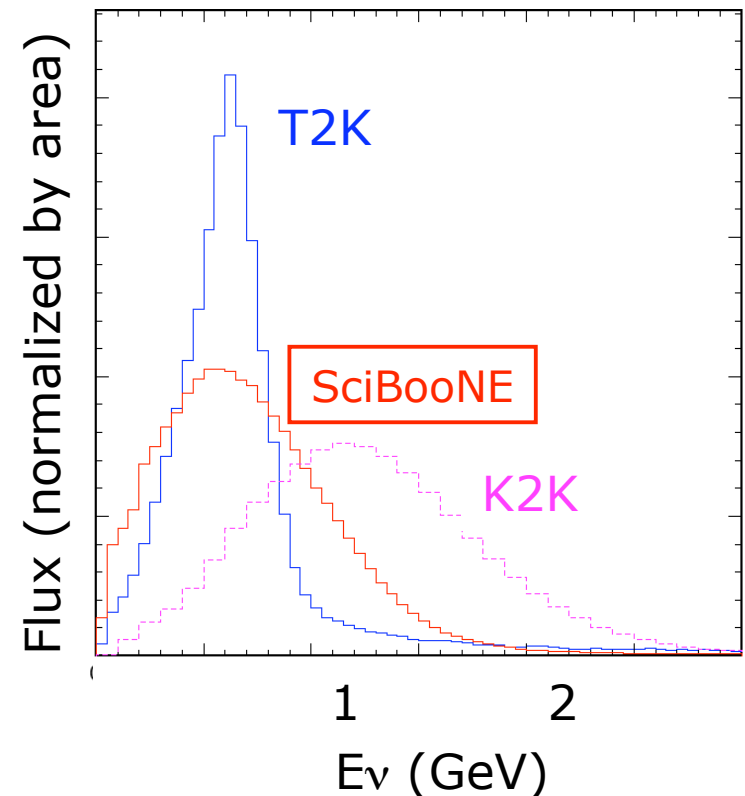
8 May, 2008

1. Introduction -Morgan Wascko
2. Civil Construction - Steve Dixon
3. MRD - Morgan Wascko
4. Data Acquisition Systems - Group
5. Mechanical Engineering - Ed Chi
6. Shipping - Hidekazu Tanaka
7. US/Japan Funding - Tsuyoshi Nakaya
8. Computing Needs - Morgan Wascko
9. Project Management - Morgan Wascko

1. Introduction to SciBooNE



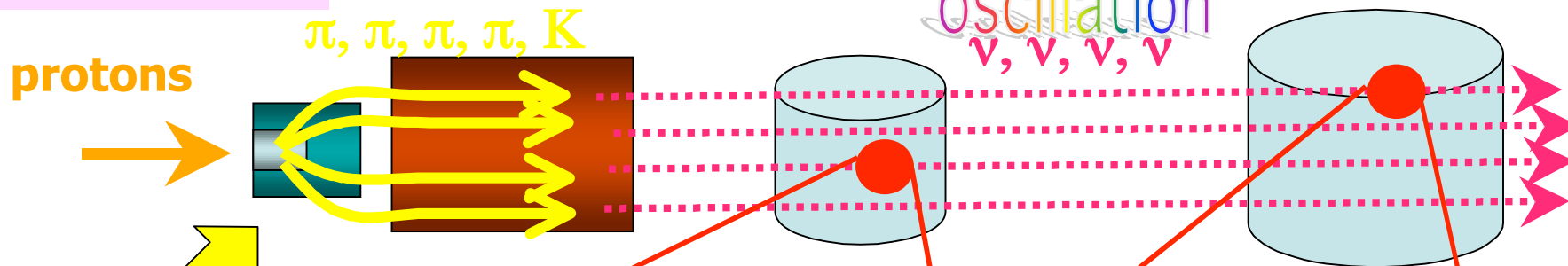
- Combine well developed detector with well understood running beam
 - Short timescales and modest cost
- Precise knowledge of σ s necessary for T2K and other experiments
 - Non quasi-elastic ν interactions
- **MiniBooNE near detector.**
 - Confirmation, redundancy for BNB ν s
- **Antineutrinos**
 - Currently unexplored physics territory.



Measuring ν Oscillations

Intense beam

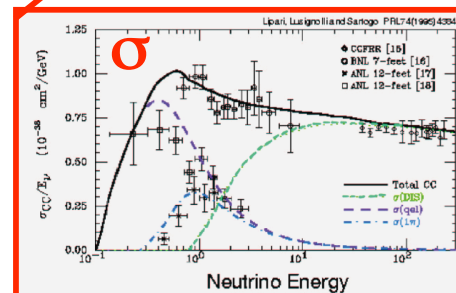
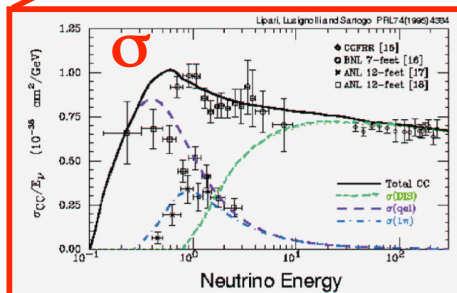
Gigantic detector



HARP

MIPP

$\Phi_\nu(E)$



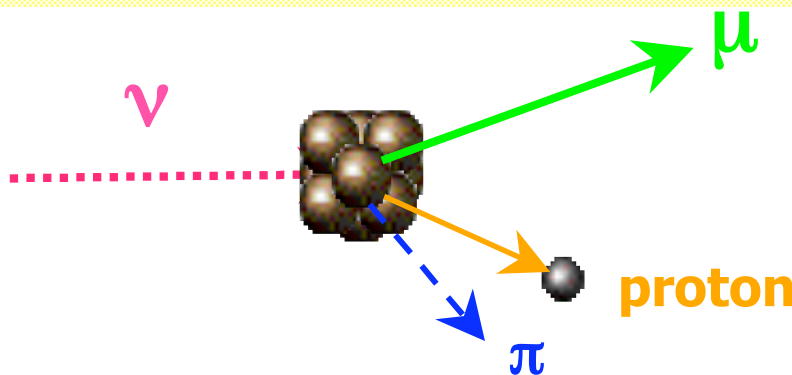
$$\sigma(E) \cdot \Phi_\nu^{\text{near}}(E) \Leftrightarrow \sigma(E) \cdot \Phi_\nu^{\text{far}}(E)$$

MiniBooNE

K2K-ND

SciBooNE

MINERvA



What's missing from K2K and MiniBooNE Cross Section Measurements?

- Good Q^2 resolution to understand nuclear effects
 - Need true nuclear models in MCs
- Resonant/coherent separation for BG measurements
- Multiparticle final states
- Antineutrino Measurements
- Absolute σ measurements for non-QE channels

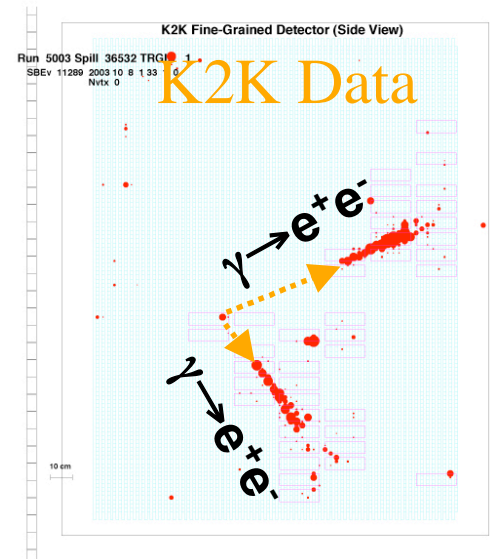
Needed to
tune neutrino
cross section
Monte Carlos

All these needed for next generation
oscillation measurements

SciBooNE Experiment

A **fine-segmented** tracking detector with an **intense low energy** neutrino beam.

- SciBar Detector
 - Well-working detector (2003.9- at K2K)
 - Fine granularity ($2.5 \times 1.3 \text{ cm}^2$) and Fully-Active
 - PID capability
- FNAL-BNB
 - An intense and low energy ($\sim 1 \text{ GeV}$) beam.
 - ≤ 1 year data taking is sufficient.
 - Both neutrinos and anti-neutrinos.
 - The beam is well-understood from hadron production experiments (HARP/BNL-E910).

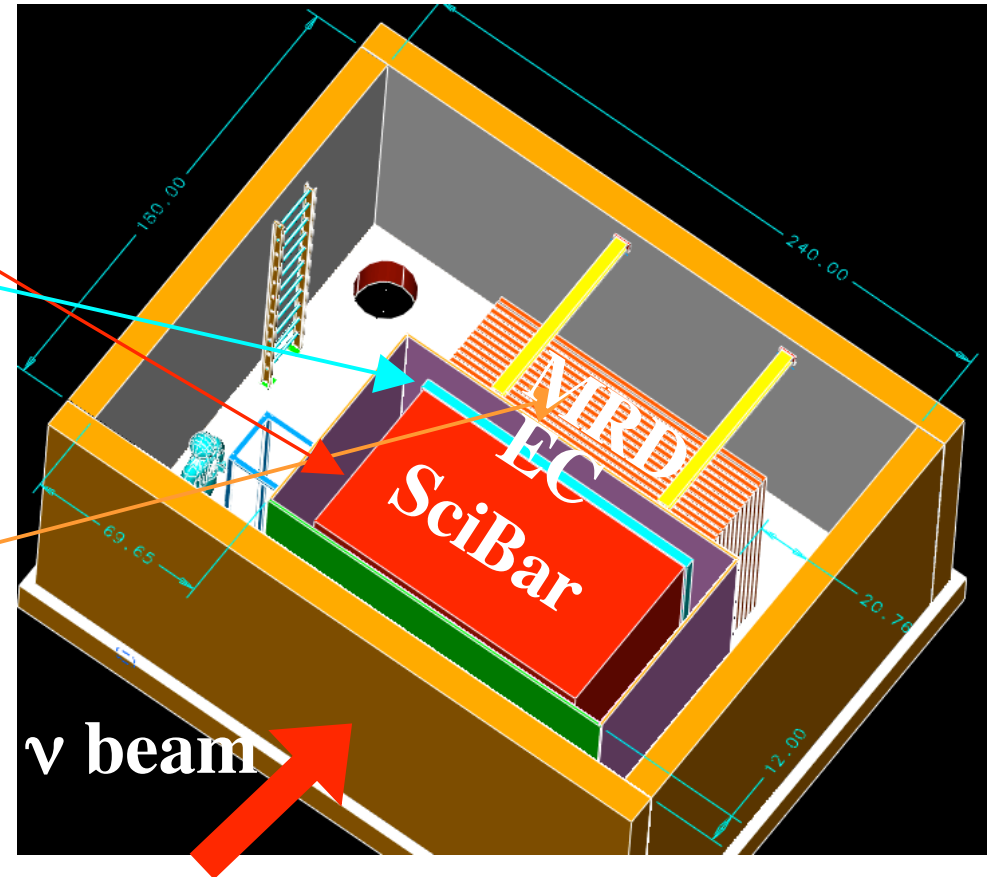


An ideal marriage of the detector and the beam for a precision neutrino interaction experiment.

(A new experimental team from K2K, MiniBooNE and new members)

Detector Components

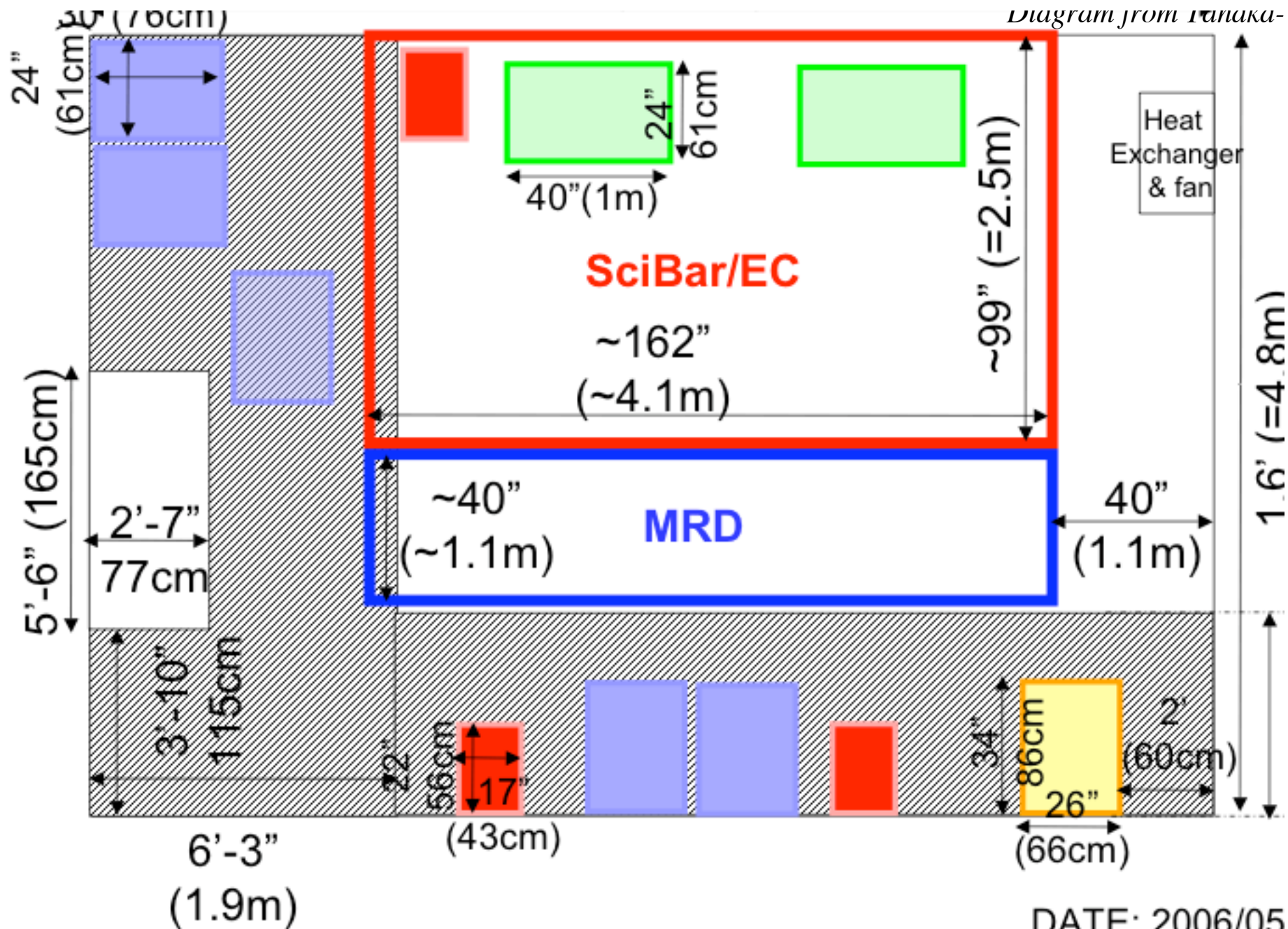
- SciBar Detector (SB)
 - From KEK, Japan
- Electron Calorimeter (EC)
 - From KEK, Japan
 - European collaborators have responsibility.
- Muon Range Detector (MRD)
 - Will be built at FNAL from the parts of an old experiment (FNAL-E605).
 - The materials (mostly) exist
 - a lot of work in recent weeks on light guides, etc.



SciBooNE Divisional Review

8 May, 2008

1. Introduction -Morgan Wascko
2. Civil Construction - Steve Dixon
3. MRD - Morgan Wascko
4. Mechanical Engineering - Ed Chi
5. Shipping - Hidekazu Tanaka
6. Data Acquisition Systems - Various
7. Installation - Hidekazu Tanaka
8. Project Management - Morgan Wascko
9. Funding - Tsuyoshi Nakaya
10. Computing Needs - Morgan Wascko

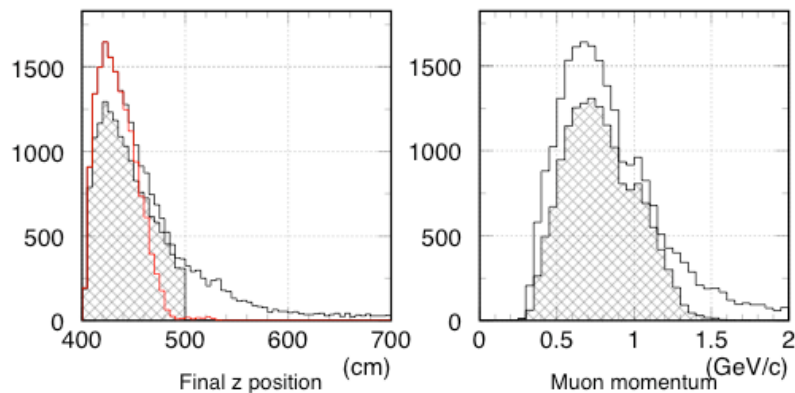


DATE: 2006/05

3. MRD



- Purpose: Measure kinetic energy of stopping muons from CC interactions
- Must detect how deep muons penetrate in layers of steel
 - High efficiency
- Design: iron plates sandwiched within plastic scintillators, read out by PMTs
- Most parts exist, except for light guides and support frame



MRD Acceptance: Final z position and momentum of stopping μ s

MRD Personnel

- Manager - Rob Napora
- Chief Advisor - Karen Kephart
- Engineering - Ernie Villegas, PPD MD
- PMT Tests - Len Bugel, Stratton Mt/Columbia
- Light Guides - Paul Nienaber, St. Mary's
- DAQ/Electronics - Al Russell, AD
- Grad Students
 - Joe Walding, Imperial
 - Yasuhiro Nakajima, Kyoto
 - Kendall Mahn and 2 first year students from Columbia
 - (Joan Catala, Ana Tornero (Valencia))

Photomultiplier Tubes for the MRD

A rough inventory of Lab 6 yielded 355 photomultiplier tubes and bases (we need 362).

We are confident that we can find another 7 tubes, the primary concern is the bases. Several of the bases—up to 50%—may need modifications and/or repairs. We will have a better idea in a few weeks after PMT testing has begun in earnest.

Light Guides & Cookies for the MRD

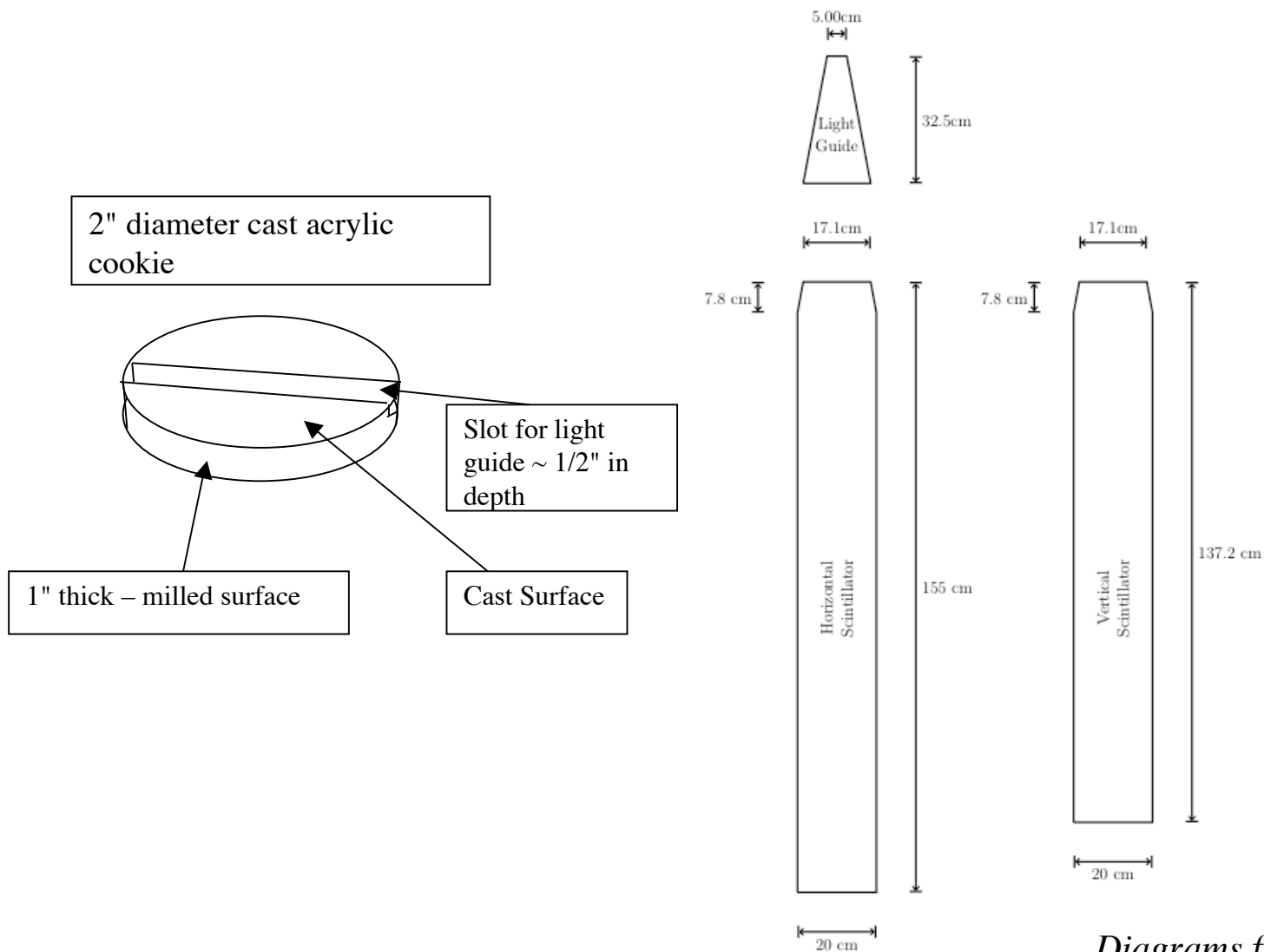
Trapezoidal Light Guides

- Simplest, cheapest design; Easiest to make, test and install*.
- Quoted price from [Designed Plastics, Inc.](#) in Elk Grove, IL. for \$6.15 per unit \times 365 units = \$2244.75 (+ tax)
- Will have a prototype for testing within a day or two.

Cookies for the MRD Light Guides

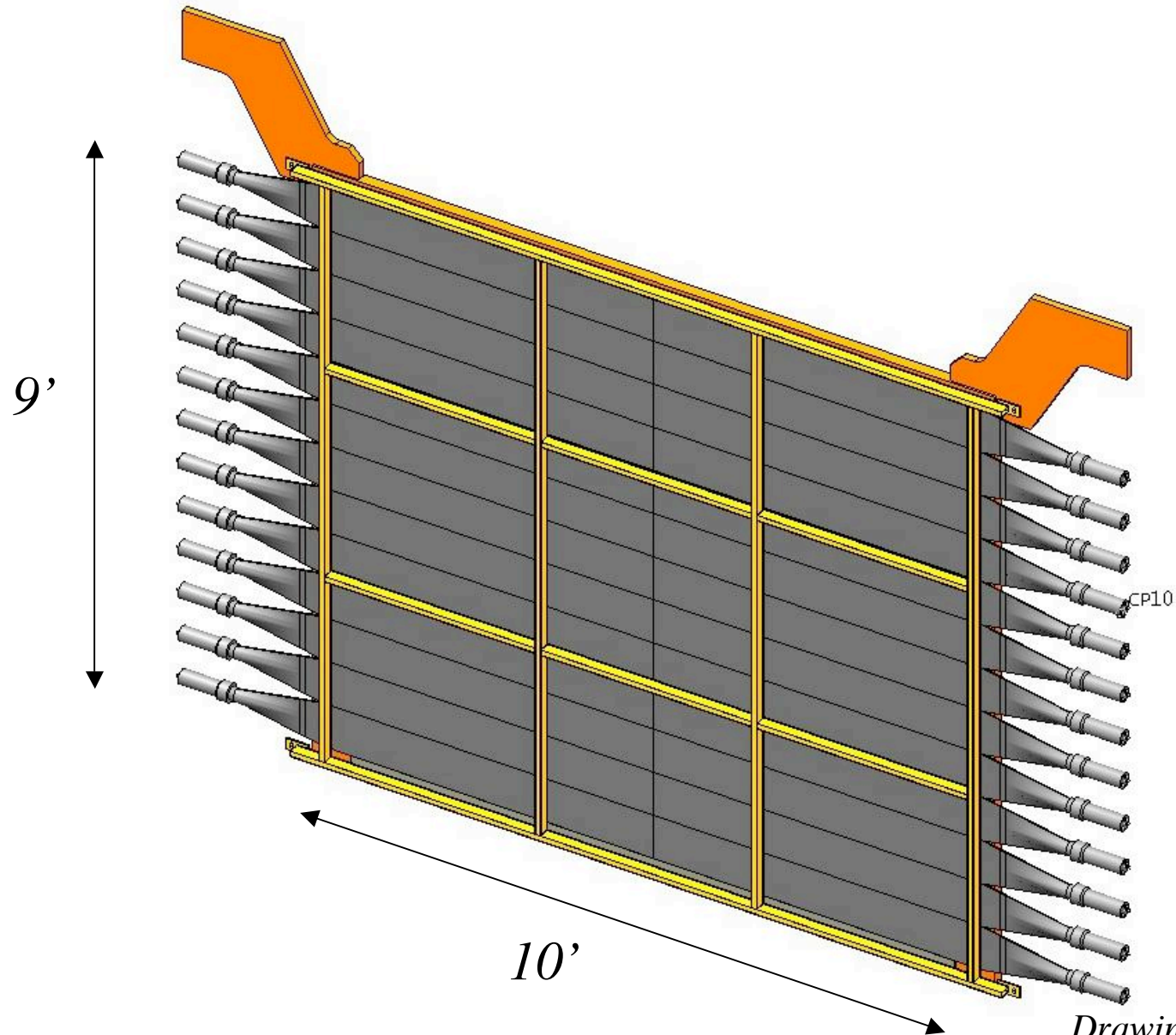
Will probably outsource this too, a conservative estimate would be to price the cookies at nearly the same cost as the light guides \sim \$2000 (+ tax).

Cookies, Light Guides



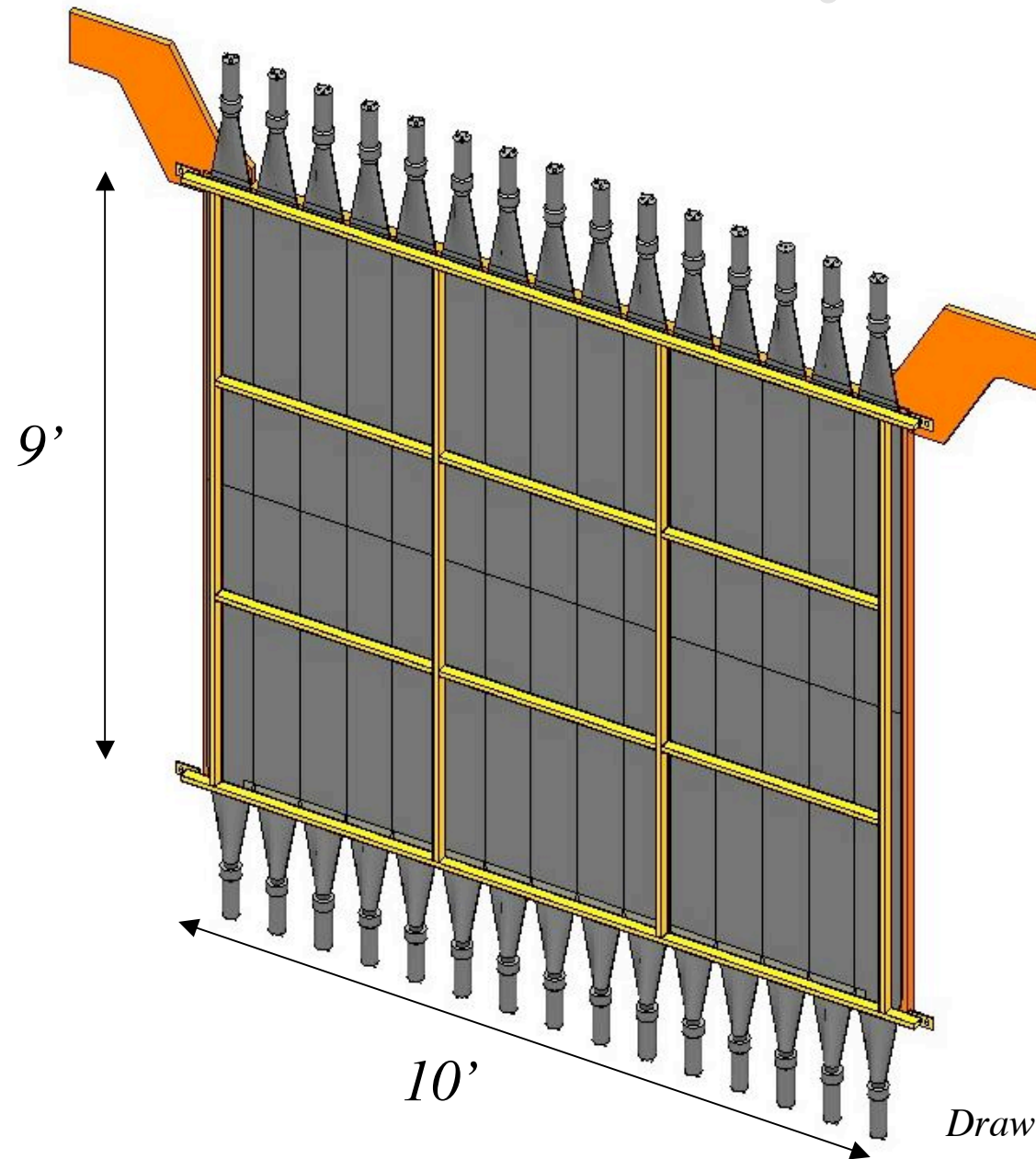
Diagrams from Karen, Rob

MRD Horizontal Layer



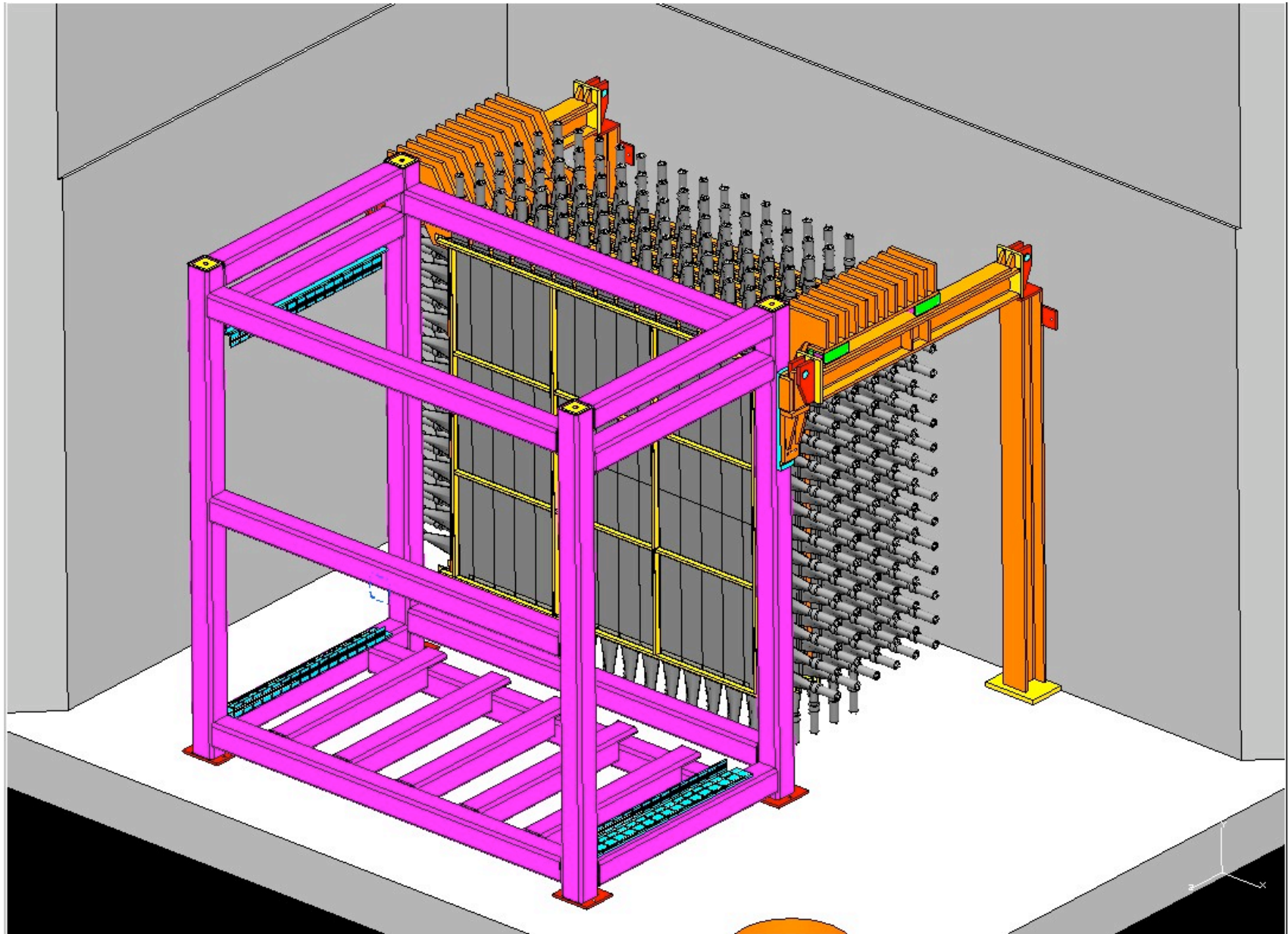
Drawing from E. Villegas

MRD Vertical Layer



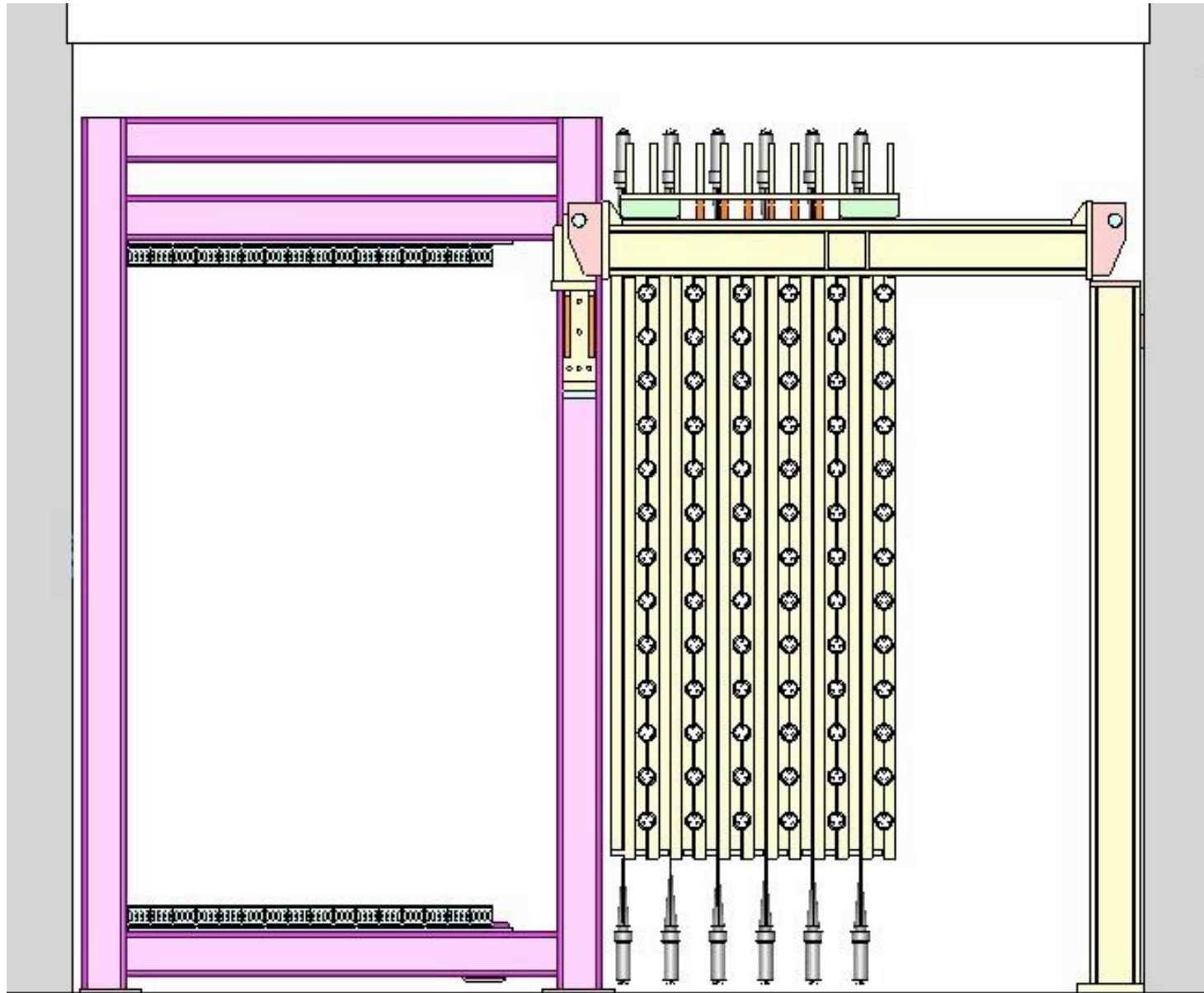
Drawing from E. Villegas

MRD attached to SB Frame



Drawing from E. Villegas

MRD attached to SB Frame



Drawing from E. Villegas

MRD Electronics

- Will use CAMAC electronics from PREP
 - Met with Mike Behnke at PREP in Feb to discuss order
 - CAMAC/PC cards, Discriminators, ADC, TDC, Logic, HV
 - He recommended specific units, and has confirmed that they have enough units for us
 - He also advised us on CAMAC drivers
 - Erik Ramberg is using similar CAMAC units for COUPP
 - Al has gotten a lot of help from him
- Tom drew up preliminary crate maps, cable routes, etc.
- Discuss DAQ in the DAQ section...

MRD Costs

<u>Item</u>	<u>Base</u>	<u>Contingency</u>	<u>Subtotal</u>	<u>BoE Totals</u>	
Support Frame Engineering	\$39,721	\$9,930	\$49,651	eng est	\$49,651
Light Guides (acrylic)	\$3,000	\$1,500	\$4,500	quote	\$13,500
Cookies	\$2,000	\$1,000	\$3,000	phys guess	
Tape	\$1,000	\$500	\$1,500	quote	
Optical Glue	\$1,000	\$500	\$1,500	phys guess	
Marvel Guard	\$2,000	\$1,000	\$3,000	phys guess	
PMT connectors	\$10,000	\$5,000	\$15,000	phys guess	\$18,000
Bases	\$2,000	\$1,000	\$3,000	phys guess	

\$81,151

- Engineering cost includes installation
- Current MRD work focus:
 - Light Guide Prototypes
 - Physics/Cost Optimization Studies
 - Preparing for students to arrive
 - DAQ/electronics work
 - PMT/scintillator/cable “factories”
 - Commissioning Plans

Light Guide Contingency Plans

If the trapezoidal light guides do not perform well in testing, alternative plans are:

Fiber Light Guide

- Use a series of 6-mm diameter acrylic fibers.
- Each scintillator panel will use 28 fibers, each $\sim 10''$ long \Rightarrow ~ 8500 feet of fiber, costing $\sim \$????$ ([Lumenyte Int'l Corp.](#)).

“Poor Man’s Adiabatic Light Guide”

- Widen and fold over the PMT end of a trapezoidal light guide
- Labor intensive, requires a skilled technician

4. Data Acquisition Systems

- Four DAQ streams
 - Three subdetectors (SB, EC, MRD)
 - ACNET
- Data streams merged event-by-event (nearline)
- Separate DAQs controlled by an external system
- ACNET DAQ: essentially same as MiniBooNE's
 - BoE = existing system
- SB/EC DAQs modified to account for differences in BNB and K2K beams
 - Shorter spill time at FNAL, but higher instantaneous rate
 - BoE = existing system
- MRD DAQ is all new
 - BoE = phys guess, drawn from lots of experience with existing systems

DAQ Personnel

- SciBar
 - Yokoyama, Kurimoto (Kyoto)
- EC
 - Ludovici, Mariani (Roma)
- MRD
 - Russell (FNAL), Walding (Imperial)
- ACNET
 - All Russell (FNAL)

Subsystem DAQ Updates

- Slides by Tanaka-san and Al Russell
- Major DAQ To-Do:
 - DAQ Controller and Integrated DAQ

More Slides from Others

- 5. SB/EC Engineering - Ed Chi
- 6. Shipping - Hidekazu Tanaka

7. US/Japan Research Funds

T. Nakaya

8. SciBooNE Computing Needs

- Similar to MiniBooNE needs
- Good communications with CD
 - Need help developing support relationships
 - What can we ask for?
- System admin for DAQ machines
- Data transfer from detector hall to mass storage
- Data storage
- Network security support
- Analysis support
 - Use of farms
 - ROOT, etc.
- PREP electronics for muon range detector (MRD)

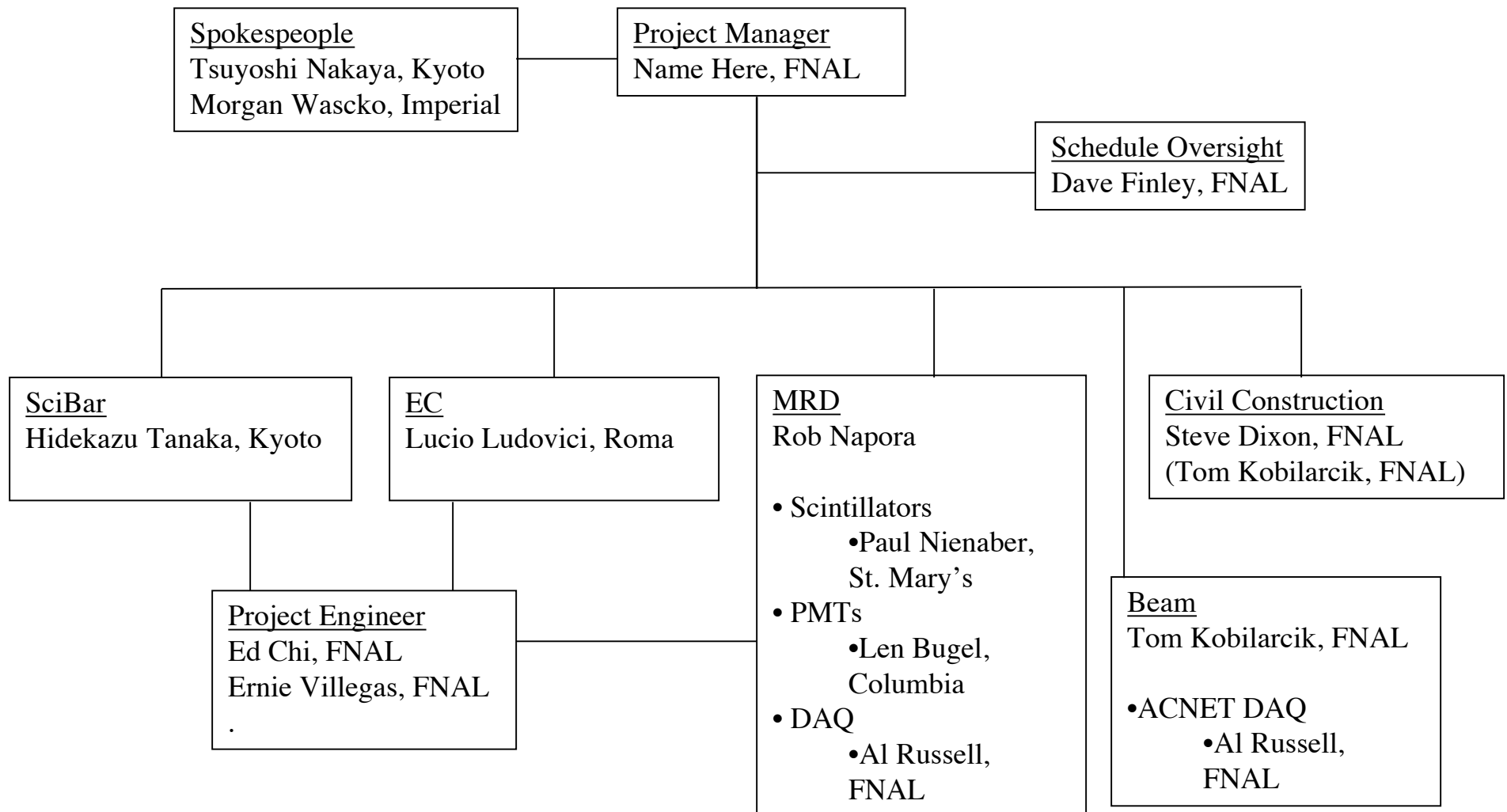
Time Scales/Schedule

- February, 2006
 - met with Amber and Bob T to discuss SciBooNE needs
 - Bob served on a Director's Review of SciBooNE and already knew about most of our needs
- Presently:
 - finalizing MOU
 - Establish personnel (liasons, etc.)
 - Developing software infrastructure, want to establish a “home” for it (at FNAL? Grid?)
- Summer:
 - Tests of data transfer from DAQ machines to enstore
 - Begin using farms for analysis (MC at first...)
- Fall:
 - Establish connectivity to detector hall

9. Project Management

- Organizational Structure
- Institutional Responsibilities
- Costs
- Schedule

Organizational Structure



FNAL Responsibilities

- PPD
 - Civil Construction
 - Project Management
 - Project Engineering
 - Computer support (desktops)
 - Guest and Visitor Support
- AD
 - Neutrino Beam, monitoring
- CD
 - Data Storage
 - DAQ system admin
 - Analysis Farms
 - PREP electronics (MRD, miscellaneous logic modules)

Non-FNAL Institutional Responsibilities

- Barcelona/Valencia: Software Infrastructure (Detector MC, analysis framework, etc.)
- Colorado: Neutrino Beam MC
- Columbia: MRD PMT testing, Neutrino Interaction MC (NUANCE)
- ICRR: Neutrino Interaction MC (NEUT)
- Imperial: Expt Leadership, MRD DAQ support
- Kyoto: Expt Leadership; SciBar Detector & DAQ
- Roma: EC Detector & DAQ
- St. Mary's: MRD light guides/testing
- Tokyo Tech: Nuclear Physics Modelling

Project Costs

<u>Item</u>	<u>Detail</u>	<u>Base</u>	<u>Contingency</u>	<u>Subtotal</u>	<u>Basis of Estimate</u>	<u>notes</u>
Shipping		\$65,000.00	\$13,000.00	\$78,000.00	quote/guess	SB and EC \$78,000.00
MRD	Support Frame	\$47,897.00	\$11,974.25	\$59,871.25	eng est	
	Light Guides	\$9,000.00	\$4,500.00	\$13,500.00	quotes/phys guess	
	PMT related	\$12,000.00	\$6,000.00	\$18,000.00	phys guess	\$91,371.25
SciBar/EC	Support Structure	\$45,500.00	\$13,650.00	\$59,150.00	eng est	
	HV Connector Cable	\$10,000.00	\$5,000.00	\$15,000.00	quote	
	Lifting Fixtures	\$8,000.00	\$2,400.00	\$10,400.00	eng est	
	A/C for dark room	\$3,224.00		\$3,224.00		
	Installation Infrastructure	\$7,700.00	\$2,310.00	\$10,010.00	eng est	\$97,784.00
Installation Rigging and Support		\$27,000.00	\$5,400.00	\$32,400.00	eng est	
	T&M Electrical	\$15,000.00	\$3,000.00	\$18,000.00	eng est	
	Communication	\$8,000.00	\$1,600.00	\$9,600.00	eng est	network & ACNET
	Alignment				phys guess	in house \$60,000.00
<u>Subtotal</u>		<u>\$258,321.00</u>	<u>\$68,834.25</u>	<u>\$327,155.25</u>		
<u>Civil</u>	<u>(from PEP)</u>	<u>\$489,000.00</u>	<u>\$201,000.00</u>	<u>\$690,000.00</u>	eng est	
		\$747,321.00	\$269,834.25	\$1,017,155.25	TEC	
Travel		\$1,000.00	\$500.00	\$1,500.00		
Students	Valencia	\$6,800.00	\$0.00	\$6,800.00	quote	
	KEK	\$27,600.00	\$0.00	\$27,600.00	quote	
Computing	UPS	\$4,000.00	\$2,000.00	\$6,000.00	exist sys	
	terabyte server	\$5,000.00	\$2,500.00	\$7,500.00	phys guess	
	ENSTORE tapes	\$20,000.00	\$10,000.00	\$30,000.00	phys guess	
	On-Line PC Upgrade	\$10,000.00	\$0.00	\$10,000.00	phys guess	
	DAQ board Upgrade	\$15,000.00	\$0.00	\$15,000.00	phys guess	
				\$104,400.00		OPC
		\$836,721.00	\$284,834.25	\$1,121,555.25		TPC

Rough Budget

<u>Source</u>	<u>Amount</u>	<u>Balance</u>
TPC	\$1,121,555	\$1,121,555
DOE Nu Initiative	\$300,000	\$821,555
US/Japan	\$263,000	\$558,555
Valencia	\$6,800	\$551,755
Roma	\$13,000	\$538,755
Kyoto (Travel)	\$35,000	\$503,755
Kyoto (Flexible)	\$20,000	\$483,755
kyoto (Summer?)	\$15,000	\$468,755

Cost to Fermilab	\$468,755
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- Add to this the cost of SciBar and EC (\$3M + \$1M), which are being provided by Kyoto and Roma

Schedule

- Schedule depends on getting money moving
- The critical schedule items are civil construction and shipping
 - Other tasks require FNAL and collaboration labor in fairly well understood amounts
 - Many physicists and especially students coming to FNAL for the summer and fall to work on assembly, installation, commissioning
- Greatest dangers of schedule slippage
 - loss of summer student labor during critical times
 - loss of Japan/US money
 - Civil shouldn't be a problem (unless it gets split into 2 fiscal year contracts)
 - Program planning office will allow 2008 running

Schedule

